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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

PAIRER (hosiery) 6-14.341

B-303 or S-60

TM 001 252

U. S. Employment Service in
Cooperation with
Pennsylvania State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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GATB #2037
August 1954

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR PAIRER (hosiery) 6-14.341

B-303 or S-60

Summary

The General Aptitude Test Battery, B-1002A, was administered on August 3, 4, and 10 to sixty women employed as Pairer 6-14.341 at the Berkshire Knitting Mills, Reading, Pennsylvania. Two of the 60 women were eliminated from the sample, leaving a final experimental sample of 58. The criterion consisted of production records over a 12 week period. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes P-Form Perception, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Pairer 6-14.341 - B-303 or S-60

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Pairer 6-14.341.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-303 or S-60

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	90	P	Part 5 Part 7	90
F	CB-1-O CB-1-P	95	F	Part 11 Part 12	90
M	CB-1-M CB-1-N	75	M	Part 9 Part 10	75

Effectiveness of Norms

The data in Table IV indicate that 10 of the 16 poor workers, or 63 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 63 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 32 of the 38 workers who made qualifying test scores, or 84 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Pairer (hosiery) 6-14.341.

II. Sample

Sixty women employed as Pairer 6-14.341 by the Berkshire Knitting Mills, Reading, Pennsylvania, were tested on August 3, 4, and 10, 1954 with the General Aptitude Test Battery, B-1002A. There were two hundred women employed as Pairer, 96 of whom were 45 years of age and under. Because aptitude test battery B-71 had been used in recent years to select for this company, all women who had been on the job less than 68 months were excluded from the experimental sample. Of the remainder, 60 were selected at random to be tested. After testing, 2 women were eliminated from the sample, one because of lack of sufficient education and one because of inadequate criterion data. Thus the final sample consisted of 58 women.

Trainees spend two days in the Inspection Department to observe and become acquainted with parts of the stockings, such as heel, welt and narrowing. They are then trained by the Line Supervisor. The minimum training time is 15 weeks.

There are no age or experience requirements, but the company prefers girls with at least a 10th grade education. In recent years all trainees have had to qualify on B-71 before they were hired.

Table II shows the means, standard deviations, ranges, Pearson product-moment correlations with the criterion, and the standard errors of correlation for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, Pearson Product-Moment Correlations with the Criterion (r), and the Standard Errors of Correlation (σ_r) for Age, Education, and Experience

Pairer 6-14.341

N = 58

	M	σ	Range	r	σ_r
Age (years)	32.9	6.4	22 - 44	-.004	.131
Education (years)	10.3	1.7	5 - 12	.164	.128
Experience (months)	130.4	62.5	69 - 270	.224	.125

There are no significant correlations between age, education or experience and the criterion. The data in Table II indicate that this sample is suitable for test development purposes, with respect to age, education and experience.

III. Job Description

Job Title: Pairer (hosiery) 6-14.341

Job Summary: Examines finished stockings for imperfections in yarn, knitting and dyeing; segregates perfect stockings and pairs them by matching at critical points.

Work Performed:

1. Receives lot of same size stockings; checks chart for specific leg and heel length for pairing process.

2. Examines stockings: Examines top side of stockings for drops, pullers, yarn and dye defects; turns stocking and examines other side for same defects. Lays aside imperfect hosiery to be returned to proper department for repair.

3. Measures stocking: Holds heel at bottom seam and measures heel and length of stocking by holding against measuring lines on pairing table to ascertain specific lengths.

4. Pairs stockings: Matches or pairs stockings by adeptly laying one stocking on top of another to match two stockings that are identical in heel, length and welt measurements.

5. Keeps work records: After the lot has been paired, records on job ticket, the number of dozen stockings paired and the number of each type of defect.

IV. Experimental Battery

All of the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of production records expressed in dozens of stockings (24 stockings, or 12 pairs, to the dozen) paired per hour. The average production for a twelve week period was computed for each worker in the sample. Average production for the twelve week period, in terms of dozens of stockings paired per hour, ranged from 7.5 to 18.9, with a mean of 11.9 and a standard deviation of 2.7.

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations, Pearson product-moment correlations with the criterion, and the standard errors of correlation for the aptitudes of the GATB.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations with the Criterion (r), and the Standard Errors of Correlation (σ_r) for the Aptitudes of the GATB

Pairer 6-14.341

N = 58

Aptitudes	M	σ	r	σ_r
G-Intelligence	94.4	12.9	.313*	.118
V-Verbal Aptitude	96.0	13.7	.289*	.120
N-Numerical Aptitude	95.0	15.2	.390**	.111
S-Spatial Aptitude	93.8	13.5	.120	.129
P-Form Perception	103.3	15.3	.337**	.116
Q-Clerical Perception	106.7	14.3	.164	.128
K-Motor Coordination	109.2	14.3	.132	.129
F-Finger Dexterity	101.7	18.4	.162	.128
M-Manual Dexterity	97.9	21.9	.233	.124

**Significant at the .01 level
*Significant at the .05 level

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appeared to be important for this occupation:

Form Perception (P) - to perceive pertinent detail while examining stockings such as knitting and dyeing defects and to match stockings properly according to heel, leg and welt measurements.

Motor Coordination (K) - to coordinate eyes, hands and fingers in the matching process, in holding stockings against others for perfecting pairing, and in pulling paired stockings from pile without disrupting others.

Finger Dexterity (F) and Manual Dexterity (M) - to turn stockings skillfully during the examining process and to handle stockings deftly during matching process.

The highest mean scores were obtained for Aptitudes P, Q, K, and F. All of the aptitudes, except Aptitude M, have standard deviations of less than 20. The smallest standard deviation was obtained for Aptitude G.

When N = 58, correlations of .337 and .259 are significant at the .01 level and the .05 level, respectively. Aptitudes N and P correlate significantly with the criterion at the .01 level of confidence. Aptitudes G and V correlate significantly with the criterion at the .05 level of confidence.

Aptitudes P, K, F and M were considered for inclusion in the test norms on the basis of the qualitative and quantitative factors cited above: all four of these aptitudes appear to be important in terms of job analysis data; Aptitude P shows

significant correlation with the criterion; Aptitudes P, K and F have relatively high means. Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes P, K, F and M and appropriate cutting scores. Since Aptitude K tended to lower the selective efficiency of norms which included Aptitudes P, F and M, Aptitude K was not included in the final test norms.

Although there is some statistical evidence of significance for Aptitudes G, V, N and Q, which warranted some preliminary consideration of these aptitudes for inclusion in the test norms, none of these aptitudes appeared to be sufficiently important on the basis of job analysis data to warrant further consideration. Therefore, none of these four aptitudes was included in the final test norms.

The cutting scores for Aptitudes P and M were set one standard deviation unit below the means and rounded to the nearest five-point score levels. Although the nearest five-point score level to one standard deviation below the mean of Aptitude F is 85, the cutting score was set at 90 because better selective efficiency was obtained at this level. The resulting norms consist of P-90, F-90, and M-75.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized with a critical score of 10 dozen stockings paired per hour. Ten dozen was used as a criterion critical score because it is at this production point that a worker is considered satisfactory by the company. Those women whose production averaged 10 or more dozen stockings per hour were placed in the high criterion group; all others were placed in the low criterion group. This resulted in 16 of the 58 women, or 28 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes P, F, and M with critical scores of 90, 90, and 75, respectively and the criterion for Pairer 6-14.341. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes P, F, and M with Critical Scores of 90, 90, and 75, Respectively and the Criterion for Pairer 6-14.341

N = 58

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	32	42
Poor Workers	10	6	16
Total	20	38	58

$r_{tet} = .58$ $\quad X^2 = 6.060$

$\sigma_{r\,tet} = .23$ $\quad P/2 < .01$

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined predictive efficiency, Aptitudes P, F, and M with minimum scores of 90, 90, and 75, respectively, are recommended as B-1002 norms for the occupation of Pairer (hosiery) 6-14.341. The equivalent B-1001 norms consist of P-90, F-95, and M-75.